

AMENDMENTS TO THE CLAIMS

The following Listing of Claims replaces all previous listings of claims in this application. Claim 2 has been canceled without prejudice or disclaimer.

Listing of Claims:

1. (Currently amended) A process for preparing a quaternary phosphonium salt comprising reacting a trialkyl-, trialkenyl- or triarylphosphine with an optionally substituted monounsaturated or polyunsaturated aliphatic, cycloaliphatic or aromatic-aliphatic alcohol having from 3 to 25 carbon atoms or its carboxylic acid esters or ethers in the presence of an acid, or by reacting a trialkyl-, trialkenyl- or triarylphosphine with an optionally substituted aliphatic, cycloaliphatic or aromatic-aliphatic halide having from 3 to 25 carbon atoms, wherein the reaction is conducted in a ternary solvent mixture, and

wherein the quaternary phosphonium salt is of general formula I



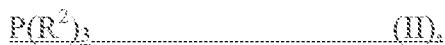
where

R^1 is an optionally substituted monounsaturated or polyunsaturated aliphatic, cycloaliphatic or aromatic-aliphatic group having from 3 to 25 carbon atoms,

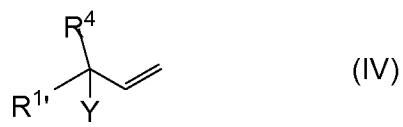
R^2 is an alkyl, alkenyl or aryl group having from 1 to 9 carbon atoms,

X is an anion equivalent of an organic or inorganic acid, and

the trialkyl-, trialkenyl- or triarylphosphine is of general formula II

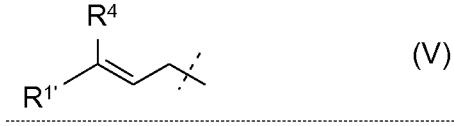


where R^2 has the meaning given above, and the trialkyl-, trialkenyl- or triarylphosphine is reacted with a monounsaturated or polyunsaturated electrophile of the general formula III or IV,



where R^1 has the meaning given above, and
 $R^{1'}$ is an optionally substituted, aliphatic, cycloaliphatic or aromatic-aliphatic hydrocarbon group having from 1 to 21 carbon atoms,
 Y is OH , Cl , Br , $\text{O}(\text{CO})\text{R}^3$ or OR^3 and R^3 is an aliphatic hydrocarbon group having from 1 to 6 carbon atoms, and

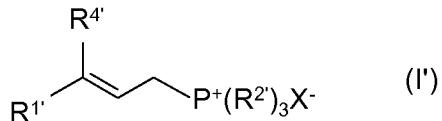
R^4 is H or CH_3 and, when an electrophile of the general formula IV is reacted,
 R^1 in formula I is a structural element of the general formula V



where $R^{1'}$ and R^4 have the meanings given above.

2. (Canceled)

3. (Currently amended) The process according to claim 1, wherein, wherein the quaternary phosphonium salts are salt is of general formula I'



where

$R^{1'}$ is an optionally substituted, aliphatic, cycloaliphatic or aromatic-aliphatic group having from 1 to 21 carbon atoms,

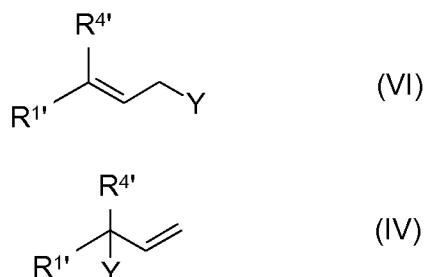
$R^{2'}$ is an aryl group having from 1 to 9 carbon atoms,

R^4 is H or CH_3 and

X is the anion equivalent of an organic or inorganic acid, and the trialkyl-, trialkenyl- or triarylphosphine are is of general formula II'



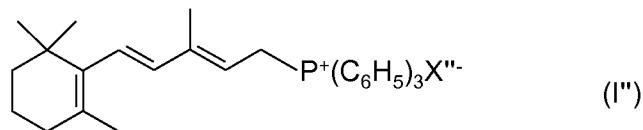
where R^2' has the meaning given above,
and the trialkyl-, trialkenyl- or triarylpophosphine is reacted with a monounsaturated or polyunsaturated electrophile of the general formula IV or VI,



where $R^{1'}$ and $R^{4'}$ have the meanings given above and
 Y is OH, Cl, Br, $O(CO)R^3$ or OR^3 and R^3 is an aliphatic hydrocarbon group having from 1 to 6 carbon atoms.

4. (Currently amended) The process according to ~~claim 2, claim 1~~, wherein the phosphine of the general formula II is triphenylphosphine.

5. (Currently amended) The process according to claim 1, wherein the quaternary phosphonium salts-salt is of the formula I''



where

X'' is Cl, Br or HSO_4 , said quaternary phosphonium salts-salt is obtainable by reacting triphenylphosphine with β -vinylionol.

6. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture comprises water, an alcohol having from 1 to 6 carbon atoms and a hydrocarbon

having from 5 to 12 carbon atoms or a mixture of various hydrocarbons having from 5 to 12 carbon atoms.

7. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture consists of water, an alcohol having from 1 to 6 carbon atoms and a hydrocarbon having from 5 to 12 carbon atoms or a mixture of various hydrocarbons having from 5 to 12 carbon atoms.

8. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture consists of water, methanol and a hydrocarbon having 7 carbon atoms or a mixture of various hydrocarbons having 7 carbon atoms.

9. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture includes at least 5% by weight of water.

10. (Currently amended) The process according to claim 1 wherein the ternary solvent mixture consists of

55-85% by weight of ~~methanol~~^{methanol},

10-25% by weight of ~~heptane~~^{heptane}, and

5-20% by weight of ~~water~~^{water}, and wherein

~~in which case the proportions chosen within said ranges must of methanol, heptane, and water total 100% by weight.~~

11. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture is in the form of a two-phase system.

12. (Previously presented) The process according to claim 1, wherein the acid is hydrochloric acid or sulfuric acid.

13. (Currently amended) The process according to claim 1, further comprising separating the ternary solvent mixture, from the other components of the reaction mixture following completion of the reaction, and by optionally recirculating at least one of the components of the solvent mixture.

14. (Currently amended) ~~The use of quaternary phosphonium salts of the general formula I prepared by a process according to claim 1 for the synthesis of A method of synthesizing retinol (vitamin A), vitamin A acetate, vitamin A propionate, vitamin A palmitate, retinal, retinoic acids, β-carotene, α-carotene, δ-carotene, zeaxanthin, astaxanthin, canthaxanthin, lycopene, citranaxanthin, β-apo-8'-carotenal, crocetin, α-cryptoxanthin, β-cryptoxanthin, phytoene, lutein, bixin, capsanthin, capsorubin, β-apo-8'-carotenoic acid methyl ester, β-apo-8'-carotenoic acid ethyl ester, β-apo-8'-carotenoic acid propionyl ester or β-apo-8'-carotenoic acid palmityl ester, comprising preparing the quaternary phosphonium salt of the general formula I by the process according to claim 1.~~

15. (Previously presented) The process according to claim 3, wherein the phosphine of general formula II' is triphenylphosphine.

16. (Previously presented) The process according to claim 1, wherein the ternary solvent mixture consists essentially of water, an alcohol having from 1 to 6 carbon atoms and a hydrocarbon having from 5 to 12 carbon atoms or a mixture of various hydrocarbons having from 5 to 12 carbon atoms.

17. (Previously presented) The process according to claim 5, wherein the ternary solvent mixture consists essentially of water, an alcohol having from 1 to 6 carbon atoms and a hydrocarbon having from 5 to 12 carbon atoms or a mixture of various hydrocarbons having from 5 to 12 carbon atoms.

18. (Previously presented) The process according to claim 5, wherein the ternary solvent mixture consists essentially of water, methanol and a hydrocarbon having 7 carbon atoms or a mixture of various hydrocarbons having 7 carbon atoms.